NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD - INTERIM

STORMWATER WET DETENTION/CHEMICAL TREATMENT SYSTEM

(No. and Ac-Ft.)
Code 787

DEFINITION

A system for detention and treatment of stormwater runoff from areas where water quality is a concern.

PURPOSE

This practice may be applied as part of a conservation management system to improve water quality through the use of a wet detention system in which physical, biological, and chemical treatment of stormwater runoff to remove contaminates such as nutrients (nitrogen and phosphorous), pesticides, heavy metals, etc., occurs.

CONDITIONS WHERE PRACTICE APPLIES

Stormwater treatment facilities are suitable for use on lands where stormwater runoff does not meet water quality criteria and/or goals through the implementation of conventional conservation practices.

This standard applies to the planning and functional design of storage and treatment facilities. It does not apply to detailed design criteria or construction specifications for individual structures or components of the stormwater treatment system.

This practice does not apply to stormwater runoff from high intensity areas located at concentrated animal feeding operations.

CRITERIA

General Criteria Applicable To All Purposes

The installation and operation of a stormwater treatment system shall comply with all Federal, state and local laws, rules, and regulations.

Components needed for a stormwater treatment facility shall be designed and constructed according to applicable NRCS conservation practice standards. The criteria for the design of components not addressed in a NRCS conservation practice standard shall be consistent with sound engineering principles.

All disturbed areas shall be vegetated in accordance with conservation practice standard, Critical Area Stabilization, Code 342.

Conveyance facilities. Conveyance facilities shall be designed to collect stormwater from areas of concern and route it to the stormwater treatment system. Facilities for the collection of stormwater can be an integral part of resource management systems covered by NRCS conservation practice standards. These facilities may include, but are not limited to drainage mains or laterals, diversions, water control structures, pumps, pipelines, grade stabilization structures, dikes, grassed waterways, or other conservation practices. See NRCS Field Office Technical Guide (FOTG) Section IV.

The capacity of conveyance facilities shall be determined by an analysis of the expected runoff

rate, the planned stormwater storage pond capacity, and the planned treatment facility.

Collected stormwater may either flow by gravity or be pumped into the wet detention pond. For systems where stormwater is pumped, a sump having adequate level control shall be used. The stormwater level may be controlled by automated equipment such as a float-controlled pump or by adequate inspection and a manually operated pump. Where the energy source for the sump pump(s) is subject to interruption, safe emergency bypass areas shall be provided for excess stormwater flows.

Sumps shall be equipped with inlets designed to protect the collection facilities from erosion. A dike, ditch, water control structure or other structure shall be provided if needed to limit the entrance of stormwater runoff into the designed inlet.

Where sediment is a concern, a sediment control basin shall be installed as the first stage of the treatment train at the inflow to the wet detention pond.

Storage and treatment facilities. The wet detention pond provides for the storage and treatment of runoff. Storage facilities are needed to store the collected stormwater runoff until it is treated within the system or reused.

Storage ponds created by earthen dams, enclosed embankments, excavated pits, and the related appurtenant structures shall be designed according to NRCS conservation practice standard Pond, Code 378.

Concrete and steel regulating reservoirs shall be designed to meet all loads associated with the structure.

The wet detention pond shall be of sufficient volume to hold a minimum of 1 inch of runoff from the area of concern. This volume may be increased as needed to achieve the water quality treatment goals or discharge requirements.

All wet detention ponds shall have an emergency response plan for spills and/or pond embankment failures.

The wet detention treatment system shall be designed to meet the appropriate water quality criteria and/or goal(s) for the receiving water body.

Wetland and chemical treatment are the primary treatment methods, however other treatment methods can be used if they have been shown to meet the following minimum design criteria:

- removes the required excess contaminate(s),
- create no secondary surface or groundwater water quality concerns, and
- create no adverse impacts on existing wetland systems.

The level of contaminate removal required will be determined using site-specific water quality data and water quality goals. Where water quality data are not available, long-term model simulation will be used to determine the amount of contaminate to be removed. The computer model used must be validated for the site.

Byproducts from the treatment process, such as sludge, must be disposed of in an environmentally sound fashion through either land application at agronomic rates or in an acceptable landfill.

Wetland treatment cells shall be designed in accordance with NRCS conservation practice standard, Constructed Wetland, Code 656.

CONSIDERATIONS

Consideration should be given to the placement of chemical treatment facility. If the chemical treatment facility is placed at the upstream end of the wet detention pond, more chemical agent will be required but the wet detention pond will make the frequency of required clean-out less due to the size of the wet detention pond. Further, since some of the stormwater may me reused on site, more stormwater may be treated than is necessary and dosage of agent will need to be able to account for variable stormwater flows. If the chemical treatment is placed outflow of the wet detention pond, the flow rate can be more closely controlled which will allow for less chemical agent, but clean-out of a smaller settling area will by necessity be more frequent.

The stormwater treatment facility should be designed to economically maximize reuse of stormwater. Usage of stored stormwater runoff for irrigation or other agricultural uses should be considered where practical.

Consideration should be given to maximizing flood control benefits of wet detention ponds.

To limit contaminate-laden stormwater as much as practical, nutrient and pest management

measures should be planned on fields contributing runoff.

Consideration should be given to design of the wet detention pond as an "offline" system such that the system captures the initial first flush of stormwater runoff and allows subsequent stormwater runoff from larger storms to bypass. The bypassed volume would not be treated. This would tend to maximize stormwater treatment since the first flush volume of stormwater runoff tends to be higher in contaminate concentration.

Protection of system components from storm events and excessive sedimentation should be considered.

Where livestock is present, consideration should be given to fencing the area to prevent access.

Downstream flows or aquifer recharge volumes dependent on runoff could be reduced. Existing wetland hydrology could be impacted by this practice.

PLANS AND SPECIFICATIONS

Plans and specifications for stormwater treatment facilities shall be prepared for specific field sites in accordance with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

As a minimum the plans and specifications shall include where applicable:

- location of all components,
- typical cross sections of structures,
- type and quality of structural materials,
- type and amount of chemicals to be used,
- type of wetland plants, and
- type and description of monitoring requirements which including frequency and parameters to be monitored.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan, specific to the stormwater treatment system, shall be prepared for use by the landowner or operator responsible for operation and maintenance. The O&M plan shall provide specific instructions for operating and maintaining the system to ensure it functions properly to achieve the intended purpose. As a minimum, the O&M plan shall include provisions to address the following:

- periodic cleaning and re-grading of collection facilities to maintain proper flow lines and functionality,
- periodic checks of treatment areas for flow lines and functionality,
- periodic vegetation maintenance in treatment areas,
- periodic checks and removal of debris as necessary from trash racks and structures to assure proper operation,
- periodic removal of sediment from traps and/or storage facilities to maintain design capacity and efficiency,
- inspection or testing of all pipeline and pumping plant components and appurtenances, as applicable,
- routine maintenance of all mechanical components in accordance with the manufacturer’s recommendations,
- periodic removal and disposal of chemical sludge where used, and
- emergency response procedures.

REFERENCES

NRCS Conservation Practice Standard
Constructed Wetland, Code 656
Critical Area Planting, Code 342
Pond, Code 378
NRCS FOTG, Section IV